IN THE CLAIMS

What is claimed is:

1. A semiconductor device, comprising:

a semiconductor substrate;

an isolation film buried in the substrate;

a gate insulating film formed between the isolation film and having end portions adjacent to the isolation film that are thicker than a central portion.

2. The semiconductor device according to claim 1, further including:

a trench in the semiconductor substrate between adjacent gate insulating films and having a width essentially the same as the distance between the adjacent insulating films; and

the isolation film is buried in the trench.

3. The semiconductor device according to claim 1, further including:

a first electrode formed on the gate insulating film;

a capacitance insulating film formed on the first electrode; and

a second electrode formed on the capacitance insulating film.

4. The semiconductor device according to claim 1, wherein:

an upper surface of the isolation film is at substantially the same height as an upper surface of the end portion of the gate insulating film.

5. The semiconductor device according to claim 1, wherein:

an upper surface of the isolation film is higher than an upper surface of the end portion of the gate insulating film.

6. The semiconductor device according to claim 1, further including:

a first electrode formed on the gate insulating film and having a recessed portion at a central first electrode portion between the isolation film.

7. The semiconductor device according to claim 1, wherein:

the semiconductor device is a flash memory.

8. A manufacturing method of a semiconductor device, comprising the steps of:

forming a first oxide film on a surface of a semiconductor substrate;

depositing a stacked film including a first conductive layer in contact with the first oxide film;

etching the stacked film and the first oxide film to form a plurality of stacked film patterns arranged on the semiconductor substrate;

oxidizing the semiconductor substrate to form a second oxide film on a surface of the semiconductor substrate sandwiched between adjacent stacked film patterns and a surface of the semiconductor substrate below end portions

of the stacked film patterns wherein the second oxide film has a film thickness thicker than the first oxide film;

forming a side wall mask film on a side of the stacked film patterns to form mask patterns including the stacked film patterns;

removing the portion of the second oxide film sandwiched between the mask patterns and a portion of the underlying semiconductor substrate using the mask patterns as a mask to form a trench in the semiconductor substrate; and

filling the trench with an insulating film.

9. The manufacturing method of a semiconductor device according to claim 8, wherein:

the step of filling the trench with an insulating film includes forming the insulating film to have a top surface having a height that essentially matches with a height of the second oxide film.

10. The manufacturing method of a semiconductor device according to claim 8, further including the steps of:

forming a capacitance insulating film on the surface including the first conductive layer after the step of filling the trench with an insulating film; and

forming an electrode on the capacitance insulating film.

11. The manufacturing method of a semiconductor device according to claim 8, wherein:

the side wall mask film includes a nitride film.

12. The manufacturing method of a semiconductor device according to claim 8, wherein:

the second oxide film is approximately 20 to 50 nm thicker than the first oxide film.

13. The manufacturing method of a semiconductor device according to claim 8, wherein:

the stacked film includes a stopper film that provides a stopper for a chemical mechanical polishing step.

14. A manufacturing method of a semiconductor device, comprising the steps of:

forming a first oxide film on a surface of a semiconductor substrate;

depositing a stacked film including a first stopper layer on the first oxide film;

etching the stacked film and the first oxide film to form a plurality of stacked film patterns arranged on the semiconductor substrate;

oxidizing the semiconductor substrate to form a second oxide film on a surface of the semiconductor substrate sandwiched between adjacent stacked film patterns and a surface of the semiconductor substrate below end portions of the stacked film patterns wherein the second oxide film has a film thickness thicker than the first oxide film;

removing the portion of the second oxide film sandwiched between the mask patterns and a portion of the underlying semiconductor substrate using the stacked film patterns as a mask to form a trench in the semiconductor

substrate; and

filling the trench with an insulating film.

15. The manufacturing method of a semiconductor device according to claim 14, wherein:

the step of filling the trench with an insulating film includes forming the insulating film to have a top surface having a height that essentially matches with a height of the first stopper layer.

16. The manufacturing method of a semiconductor device according to claim 14, further including the steps of:

removing the stacked film patterns so that at least the second oxide film below the stacked film patterns remain;

forming a gate oxide film in a region between the second oxide film;

forming a first electrode over the gate oxide film and at least a portion of the second oxide film.

17. The manufacturing method of a semiconductor device according to claim 16, wherein:

the first electrode includes end portions next to the insulating film that are higher than a central portion of the first electrode.

18. The manufacturing method of a semiconductor device according to claim 16,

wherein:

the insulating film has a top surface that substantially matches with a top surface of the first electrode.

19. The manufacturing method of a semiconductor device according to claim 16, further including the steps of:

forming a capacitance insulating film on the first electrode; and

forming a second electrode on the capacitance insulating film.

20. The manufacturing method of a semiconductor device according to claim 16, wherein:

the first electrode includes polysilicon.